Practitioner's Docket No. ___P–1094___   **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **YINYAN HUANG, ET. AL.**

Application No.: **10/025,662**   Group No.: **1745**
Filed: **DECEMBER 19, 2001**   Examiner: **ANGELA J. MARTIN**
For: **AN EXHAUST TREATMENT AND FILTRATION SYSTEM FOR MOLTEN CARBONATE FUEL CELLS**

Confirmation No.:   6526

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT TRANSMITTAL

WARNING: Failure to file a complete response in compliance with § 1.135(c) leads to a reduction in patent term adjustment — See § 1.704(c)(7).

1. Transmitted herewith is an amendment for this application.

STATUS

2. Applicant is

   ☐ a small entity. A statement:

      ☐ is attached.

      ☐ was already filed.

CERTIFICATION UNDER 37 C.F.R. §§ 1.8(a) and 1.10*
(When using Express Mail, the Express Mail label number is mandatory;
Express Mail certification is optional.)

I hereby certify that, on the date shown below, this correspondence is being:

MAILING

☑ deposited with the United States Postal Service in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

37 C.F.R. § 1.8(a)   **37 C.F.R. § 1.10 ***

☑ with sufficient postage as first class mail.   ☐ as "Express Mail Post Office to Addressee"

Mailing Label No. _____ (mandatory)

TRANSMISSION

☐ facsimile transmitted to the Patent and Trademark Office, (703) _____-_____.

Date: *August 3, 2004*

Signature: *Holly Hart*

Holly Hart

(type or print name of person certifying)

* *Only the date of filing (§ 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under § 1.8 continues to be taken into account in determining timeliness. See § 1.703(f). Consider "Express Mail Post Office to Addressee" (§ 1.10) or facsimile transmission (§ 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.*

☑ other than a small entity.

EXTENSION OF TERM

NOTE: "Extension of Time in Patent Cases (Supplement Amendments) — If a timely and complete response has been filed after a Non-Final Office Action, an extension of time is not required to permit filing and/or entry of an additional amendment after expiration of the shortened statutory period.

If a timely response has been filed after a Final Office Action, an extension of time is required to permit filing and/or entry of a Notice of Appeal or filing and/or entry of an additional amendment after expiration of the shortened statutory period unless the timely-filed response placed the application in condition for allowance. Of course, if a Notice of Appeal has been filed within the shortened statutory period, the period has ceased to run." Notice of December 10, 1985 (1061 O.G. 34-35).

NOTE: See 37 C.F.R. § 1.645 for extensions of time in interference proceedings, and 37 C.F.R. § 1.550(c) for extensions of time in reexamination proceedings.

NOTE: 37 C.F.R. § 1.704(b) ". . .an applicant shall be deemed to have failed to engage in reasonable efforts to conclude processing or examination of an application for the cumulative total of any periods of time in excess of three months that are taken to reply to any notice or action by the Office making any rejection, objection, argument, or other request, measuring such three-month period from the date the notice or action was mailed or given to the applicant, in which case the period of adjustment set forth in § 1.703 shall be reduced by the number of days, if any, beginning on the day after the date that is three months after the date of mailing or transmission of the Office communication notifying the applicant of the rejection, objection, argument, or other request and ending on the date the reply was filed. The period, or shortened statutory period, for reply that is set in the Office action or notice has no effect on the three-month period set forth in this paragraph."

3. The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136 apply.

(complete (a) or (b), as applicable)

(a) ☑ Applicant petitions for an extension of time under 37 C.F.R. § 1.136 (fees: 37 C.F.R. § 1.17(a)(1)-(4) for the total number of months checked below:

Extension (months)	Fee for other than small entity	Fee for small entity
☑ one month	$ 110.00	$ 55.00
☐ two months	$ 420.00	$ 210.00
☐ three months	$ 950.00	$ 475.00
☐ four months	$ 1,480.00	$ 740.00

Fee: $ **110.00**

If an additional extension of time is required, please consider this a petition therefor.

(check and complete the next item, if applicable)

☐ An extension for _____ months has already been secured. The fee paid therefor of $_____ is deducted from the total fee due for the total months of extension now requested.

Extension fee due with this request $ **110.00**

OR

(b) ☐ Applicant believes that no extension of term is required. However, this is a conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition for extension of time.

(Amendment Transmittal [9–19]—page 2 of 4)

FEE FOR CLAIMS

4. The fee for claims (37 C.F.R. § 1.16(b)-(d)) has been calculated as shown below:

	(Col. 1)		(Col. 2)	(Col. 3)	SMALL ENTITY			OTHER THAN A SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDIT. FEE	OR	RATE	ADDIT. FEE
TOTAL	20	MINUS	22	=	x$9 =	$		x$18 =	$
INDEP.	5	MINUS	6	=	x$43 =	$		x$86 =	$
☐ FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+$145 =	$		+$290 =	$
					TOTAL ADDIT. FEE	$	OR	TOTAL ADDIT. FEE	$

* If the entry in Col. 1 is less than entry in Col. 2, write "0" in Col. 3.
** If the "Highest No. Previously Paid for" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest No. Previously Paid For" (Total or indep.) is the highest number found in the appropriate box in Col. 1 of a prior amendment or the number of claims originally filed.

WARNING: *"After final rejection or action (§ 1.113) amendments may be made cancelling claims or complying with any requirement of form which has been made." 37 C.F.R. § 1.116(a) (emphasis added).*

(complete (c) or (d), as applicable)

(c) ☑ No additional fee for claims is required.

OR

(d) ☐ Total additional fee for claims required $_____.

FEE PAYMENT

☑ Attached is a ☑ check ☐ money order in the amount of $ 110.00

☐ Authorization is hereby made to charge ~~the amount of $x~~_____

    ☐ to Deposit Account No. _____

    ☐ to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: *Credit card information should not be included on this form as it may become public.*

☐ Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

FEE DEFICIENCY

NOTE: If there is a fee deficiency and there is no authorization to charge an account, additional fees are necessary to cover the additional time consumed in making up the original deficiency. If the maximum, six-month period has expired before the deficiency is noted and corrected, the application is held abandoned. In those instances where authorization to charge is included, processing delays are encountered in returning the papers to the PTO Finance Branch in order to apply these charges prior to action on the cases. Authorization to charge the deposit account for any fee deficiency should be checked. See the Notice of April 7, 1986, (1065 O.G. 31-33).

6. ☑ If any additional extension and/or fee is required, charge Account
    No. __03-3420__.

AND/OR

☑ If any additional fee for claims is required, charge Account
    No. __03-3420__.

SIGNATURE OF PRACTITIONER

Reg. No.: 31,945

SCOTT R. COX
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(Amendment Transmittal [9-19]—page 4 of 4)

KIRK-OTHMER

CONCISE ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

4th EDITION
Volume 1

ⓦWILEY-INTERSCIENCE

A John Wiley & Sons, Inc., Publication

Table 1. Mechanical Properties of Acetal Resin

Property	ASTM test method	Homopolymer	Copolymer
tensile strength, yield, MPa[a], 23°C	D638	68.9	60.6
elongation, break, %	D638	25–75	40–75
tensile modulus, MPa[a], 23°C	D638	3100	2825
flexural strength, MPa[a],23°C	D790	97.1	89.6
flexural modulus, MPa[a], 23°C	D790	2830	2584
compressive stress, MPa[a], 23°C	D695	35.8	31
1% deflection		35.8	31
shear strength, MPa[a], 23°C	D732	65	53
Izod impact strength, notched, 3.175 mm, J/m[b], 23°C		69–122	53–80
specific gravity	D792	1.42	1.41

[a] To convert MPa to psi, multiply by 145.
[b] To convert J/m to ft · lb/in., divide by 53.39.

by Du Pont; the term copolymer refers to Celcon acetal copolymer resins (registered trademark of Hoechst Celanese Corporation).

Structure and Properties

The many commercially attractive properties of acetal resins are due in large part to the inherent high crystallinity of the base polymers. Values reported for percentage crystallinity (x-ray, density) range from 60 to 77%. The lower values are typical of copolymer. Polyoxymethylene most commonly crystallizes in a hexagonal unit cell with the polymer chains in a 9/5 helix.

The high crystallinity of acetal resins contributes significantly to their excellent resistance to most chemicals, including many organic solvents.

Mechanical Properties. Stiffness, resistance to deformation under constant applied load (creep resistance), resistance to damage by cyclical loading (fatigue resistance), and excellent lubricity are mechanical properties for which acetal resins are perhaps best known and which have contributed significantly to their excellent commercial success.

Typical values of important properties of general purpose acetal resins (homopolymer and copolymer) are collected in Table 1.

Electrical Properties. The dielectric constant is constant over the temperature range of most interest (−40 to 50°C).

Chemical Structure and Properties. Homopolymer consists exclusively of repeating oxymethylene units. The copolymer contains alkylidene units (eg, ethylidene—CH_2—CH_2—) randomly distributed along the chain. The number-average molecular weight of most commercially available acetal resins is between 20,000 and 90,000.

The ionic polymerizations of formaldehyde and trioxane are equilibrium reactions. Unless suitable measures are taken, polymer will begin to revert to monomeric formaldehyde at processing temperatures by depolymerization (called unzipping) which begins at chain ends.

Acetal resins are generally stable in mildly alkaline environments. However, bases can catalyze hydrolysis of ester end groups, resulting in less thermally stable polymer. Properly end-capped acetal resins, substantially free of ionic impurities, are relatively thermally stable. Like most other engineering thermoplastics, acetal resins are susceptible to photooxidation by oxidative radical chain reactions.

Manufacturing

Homopolymer. Formaldehyde polymerizes by both anionic and cationic mechanisms. Strong acids are needed to initiate cationic polymerization. Anionic polymerization can be initiated by relatively weak bases (eg, pyridine). Homopolymer is typically treated to replace hemiformal endgroups with more stable endgroups (eg, ester) in a process known as end-capping.

Copolymer. Copolymerization of trioxane with cyclic ethers or formals is accomplished with cationic initiators. Raw copolymer is typically treated in melt, suspension, or solution to depolymerize unstable fractions.

Product from melt or suspension treatment is obtained directly as crumb or powder. Polymer recovered from solution treatment is obtained by precipitative cooling or spray drying. Polymer with stable end groups may be washed and dried to remove impurities, especially acids or their precursors, prior to finishing operations.

Processing and Fabrication

Finishing. All acetal resins contain various stabilizers introduced by the supplier in a finishing extrusion (compounding) step.

Fabrication. Acetal resins are most commonly fabricated by injection molding.

Scrap and Recycle. Acetal resins can be processed with very little waste. Sprues, runners, and out-of-tolerance parts can, in general, be ground and the resins reused.

Resin Grades. Nonfilled and unmodified (except for stabilizers) grades of acetal resin are generally differentiated on the basis of melt index.

Health and Safety

When processed and used according to manufacturer's recommendations, acetal resins present no extraordinary health risks.

Uses

Acetal resins are used in conveying devices, gears, plumbing and irrigation applications, automotive parts, and many household appliances.

JOHN B. STARR
Hoechst Celanese Corporation

O. Vogl, ed., *Polyaldehydes,* Marcel Dekker, New York, 1967.

R. N. MacDonald, *Macromolecular Synthesis,* Vol. 3, John Wiley & Sons, Inc., New York, 1968.

A. Serle in J. M. Margolis, ed., *Engineering Thermoplastics,* Marcel Dekker, New York, 1985.

ACETATE AND TRIACETATE FIBERS. See FIBERS, CELLULOSE ESTERS.

ACETIC ACID AND DERIVATIVES

ACETIC ACID

Acetic acid, CH_3COOH, is a corrosive organic acid having a sharp odor, burning taste, and pernicious blistering properties. It is found

in ocean water, oilfield brines, rain, and at trace concentrations in many plant and animal liquids. It is central to all biological energy pathways. Fermentation of fruit and vegetable juices yields 2–12% acetic acid solutions, usually called vinegar (qv). Any sugar-containing sap or juice can be transformed by bacterial or fungal processes to dilute acetic acid.

Most of the acetic acid is produced in the United States, Germany, Great Britain, Japan, France, Canada, and Mexico. Total annual production in these countries is close to four million tons. Uses include the manufacture of vinyl acetate and acetic anhydride. Vinyl acetate is used to make latex emulsion resins for paints, adhesives, paper coatings, and textile finishing agents. Acetic anhydride is used in making cellulose acetate fibers, cigarette filter tow, and cellulosic plastics.

Physical Properties

Acetic acid, fp 16.635°C, bp 117.87°C at 101.3 kPa, is a clear, colorless liquid. Water is the chief impurity in acetic acid. Traces of acetaldehyde, acetic anhydride, formic acid, biacetyl, methyl acetate, ethyl acetoacetate, iron, and mercury are sometimes found.

A summary of the physical properties of glacial acetic acid is given in Table 1.

Chemical Properties

Decomposition Reactions. Minute traces of acetic anhydride are formed when very dry acetic acid is distilled.

Acid–Base Chemistry. Acetic acid dissociates in water, $pK_a = 4.76$ at 25°C. It is a mild acid which can be used for analysis of bases too weak to detect in water. It readily neutralizes the ordinary hydroxides of the alkali metals and the alkaline earths to form the corresponding acetates.

Acetylation Reactions. Alcohols may be acetylated without catalysts by using a large excess of acetic acid.

$$CH_3COOH + ROH \rightarrow CH_3COOR + H_2O$$
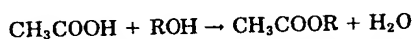
Nearly all commercial acetylations are realized using acid catalysts.

Economic Aspects

Acetic acid has a place in organic processes comparable to sulfuric acid in the mineral chemical industries and its movements mirror the industry. Growth of synthetic acetic acid production in the United States was greatly affected by the dislocations in fuel resources of the 1970s. The growth rate for 1988 was 1.5%.

About half of the world production comes from methanol carbonylation and about one-third from acetaldehyde oxidation. Another tenth of the world capacity can be attributed to butane–naphtha liquid-phase oxidation. Appreciable quantities of acetic acid are recovered from reactions involving peracetic acid.

Health and Safety

Acetic acid has a sharp odor and the glacial acid has a fiery taste and will penetrate unbroken skin to make blisters. Prolonged exposure to air containing 5–10 mg/m³ does not seem to be seriously harmful, but there are pronounced, undesirable effects from constant exposure to as high as 26 mg/m³ over a 10-day period.

Glacial acetic acid is dangerous, but its precise toxic dose is not known for humans. The LD_{50} for rats is said to be 3310 mg/kg, and for rabbits 1200 mg/kg. Ingestion of 80–90 g must be considered extraordinarily dangerous for humans. Vinegar, on the other hand, which is dilute acetic acid, has been used in foods and beverages since the most ancient of times.

FRANK S. WAGNER, JR.
Nandina Corporation

D. Ambrose and N. B. Ghiassee, *J. Chem. Thermodyn.* **19**, 505–519 (1987)

J. F. Roth, *Catal. Today* **13**(1), 1–12 (1992); J. R. Zoeller and co-workers, *ibid.,* 73–91 (1992).

A. Popoff in J. J. Lagowski, ed., *Chemistry of Nonaqueous Solvents,* Vol. 3, Academic Press, New York, 1970.
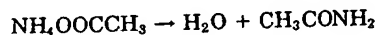
ACETAMIDE

Acetamide, C_2H_5NO, mol wt 59.07, is a white, odorless, hygroscopic solid derived from acetic acid and ammonia. The melt is a solvent for organic substances; it is used in electrochemistry and organic synthesis. Pure acetamide has a bitter taste. It is found in coal mine waste dumps.

Physical and Chemical Properties

Table 1 lists many of acetamide's important physical properties. Acetamide, CH_3CONH_2, dissolves easily in water, exhibiting amphoteric behavior. It is slow to hydrolyze unless an acid or base is present. It combines with acids, eg, HBr, HCl, HNO_3, to form solid complexes.

Preparation and Manufacture

Most commercial routes for the production of acetamide involve dehydration of ammonium acetate:

$$NH_4OOCCH_3 \rightarrow H_2O + CH_3CONH_2$$

Health and Safety

Acetamide has been used experimentally as a source of nonprotein nitrogen for sheep and dairy cattle. It does not appear to be toxic in amounts of about 2–3% of ration.

Economic Aspects

Heico Chemicals is the only producer of acetamide in the United States. Acetamide appears to have a wide spectrum of applications. It suppresses acid buildup in printing inks, lacquers, explosives, and perfumes. It is a mild moisturizer and is used as a softener for leather, textiles, paper, and certain plastics. It finds some applications in the synthesis of pharmaceuticals, pesticides, and antioxidants for plastics.

Table 1. Properties of Glacial Acetic Acid

Property	Value
freezing point, °C	16.635
boiling point, °C	117.87
density, g/mL at 20°	1.0495
refractive index, n_D^{25}	1.36965
heat of vaporization ΔH_v, J/g[a] at bp	394.5
specific heat (vapor), J/(g·K)[a] at 124°C	5.029
flammability limits, vol % in air	4.0 to 16.0
autoignition temperature, °C	465

[a] To convert J to cal, divide by 4.184.

Table 1. Physical Properties of Acetamide

Property	Value
melting point (trigonal), °C	80.0–80.1
triple point, K	353.33
heat of melting, ΔH_m, kJ/kg[a]	264
dielectric constant	59

[a] To convert kJ to kcal, divide by 4.184.